pain is less uniformly successful because the cause of the pain cannot always be completely identified. The rigid interbody fusion increases the mechanical stress on the surrounding segments which leads to the proliferation of degenerative pathology.

558 CONTACT STRESSES IN THE HUMAN ANKLE WITH A FOCAL RESURFACING IMPLANT

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Purpose: Focal resurfacing of persistent osteochondral defects with a metal implant is a promising treatment option for middle-aged patients who are poor candidates for biological resurfacing. The superior dome of the talus is a common site for this pathology, but the geometric complexity of the talar articular surface presents challenges to successful implant design, selection, and surgical placement. The purpose of this study was to document the effect of small perturbations of implant insertion height on the cartilage contact mechanics after focal resurfacing with a metal implant.
Methods: Three human cadaver ankles were subjected to a series of loading experiments. Each specimen was first tested in an intact condition; while the specimen was axially loaded to 300 N (simulating bipedal standing), contact stresses in the talocrural joint were measured using a high-resolution piezoresistive transducer (TekScan #5033, TekScan Inc.). Next, a simulated osteochondral defect (15 mm diameter) was created on the medial edge of the talar dome, and the defect was then resurfaced with a metal implant (HemiCAP®, Arthrosurface Inc.) using a custom implant-to-bone interface device that allowed fine (0.25 mm step) control of implant height (Figure 1). All decisions in this surgery, including selection of a "best fit" metal surface component and the zero-reference height of implantation, were made by an experienced surgeon. Finally, contact stress measurements were obtained at a variety of implant heights (5 conditions: −0.5 mm, −0.25 mm, 0 mm, +0.25 and +0.5 mm, with respect to the reference height), as well as without attaching the metal surface component (i.e., a non-resurfaced defect control). The full series of tests were then repeated at least four times for each ankle, with the order of testing randomized.
Results: Contact stresses were distributed relatively uniformly across the intact articular surface, and local contact stress values were typically below 2.0 MPa. Following the introduction of a surface defect, locally elevated contact stresses, up to 3.8 MPa, were observed at the anterior-central region near the border of the defect. The "best available" implant height, i.e. the height at which the implant started to bear distinct contact forces, was within ±0.25 mm of the zero-reference height. Compared to these best available conditions, peak contact stress values in the implant-on-cartilage contact area increased/decreased dramatically when the implant was 0.25 mm proud/recessed, respectively (Figure 2).
Conclusions: Cartilage contact stresses after focal resurfacing, especially opposite the implant itself, appear to be sensitive to relatively small perturbations of implant height. In clinical situations, the poroelastic characteristics of articular cartilage, along with active remodeling of the neighboring cartilage, may offset small incongruities in the implant-to-cartilage interface. Bone remodeling capability also may allow longer-term accommodation. However, to minimize the risk of excessive cartilage contact stresses acutely after focal resurfacing, even a very small degree of proud implantation should be carefully avoided.

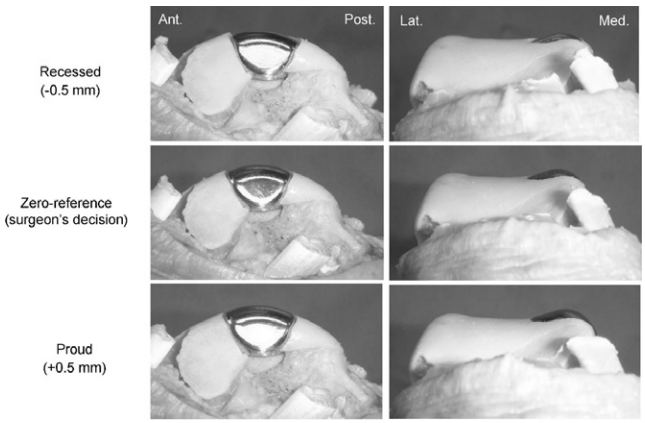

Figure 1. Height control of metal resurfacing implant on the medial edge of the talar dome.

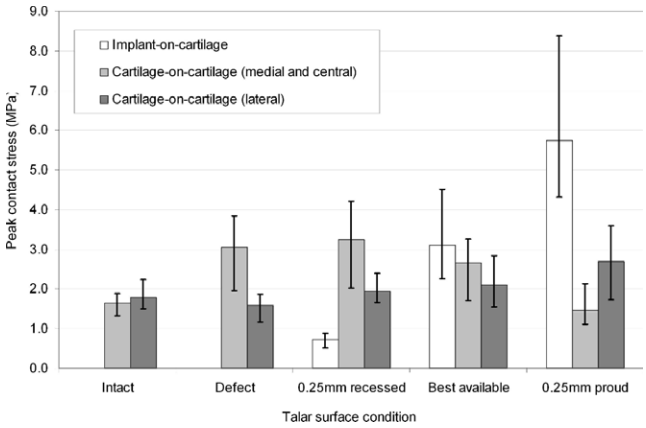

Figure 2. Peak contact stresses in the talocrural joint (mean ± range, n = 3).

559 THE LONG-TERM SURVIVAL RESULTS OF TOTAL KNEE ARTHROPLASTY IN PATIENTS UNDER THE AGE OF 60 YEARS: IMPLANT VS CLINICAL OUTCOMES

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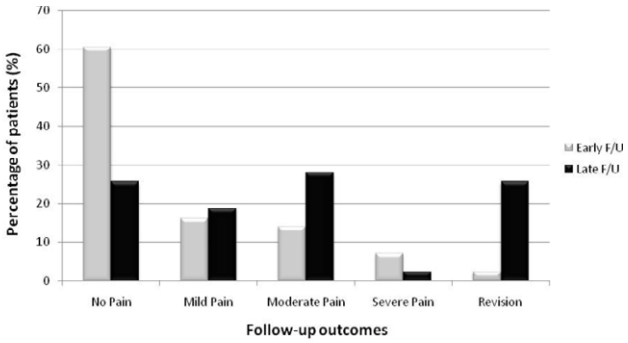
Purpose: Total knee arthroplasty (TKA) is recognized as a successful treatment for elderly patients with knee pain. TKA are now being performed in younger patients and outcomes in this group are not clear. We therefore examined the long-term implant survival and function after TKA for non-inflammatory arthritis in patients under the age of 60 years at the time of surgery.
Methods: Patients were recruited from a registry of knee arthroplasty. They had been interviewed at 3.5 years post surgery (early follow-up) and were invited to attend a late follow-up visit (15.5 years). At early follow-up, patients were asked about their current pain and to recall their preoperative pain scores. At late follow-up, data including the Oxford Knee Score (OKS) was collected via a postal questionnaire. If no response was obtained patients were telephoned. Finally if this was unsuccessful information concerning revision was obtained through GP contact or review of hospital records. An OKS score of ⩽24/48 was defined as a poor functional outcome.



Legend: n=43 with pain data at both follow-up visits, Early follow up = 3.5 (1.8) years; late follow-up = 15.5 (1.7) years. Revision includes patella surgery

Figure 1. Long term implant and pain outcome in patients under the age of 60 years at time of total knee arthroplasty.

Results: 60 patients underwent TKR between 1987 and 1993, with 98% reporting severe knee pain pre-operatively. Their median age at time of surgery was 57.4 years and 60% were female. By late follow-up, 6 had died and 9 were lost to follow-up. Of the remaining 45 patients, 2 had patella revision, 9 revision of the implant and 34 patients had OKS available at late follow-up. Implant survival was 80% at late follow-up; implant revisions were performed 2 to 12 years after surgery, 5 for aseptic loosening and 4 for septic loosening.
While implant and patella revisions were uncommon, the remaining patients' clinical outcomes demonstrated moderate to poor pain and function